



Northern Rhodesia

Department of Agriculture

ANNUAL REPORT
for the Year
1949

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J. H. Rhodes, Agricultural Officer, Lundazi.
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Department of Agriculture

ANNUAL REPORT FOR THE YEAR 1949

INTRODUCTION.

1. The main feature of the year was the failure of the rains early in the season, which reduced crop yields in most parts of the Territory. Maize had to be imported to make up the shortfall in production and there were local food shortages in a few rural areas which had to be met with famine relief measures. Serious famine did not occur. Tobacco was less affected by drought than had been feared in the early part of the season and record crops were produced in both the Eastern and Western areas. The expansion of farming by European farmers continued, and record acreages of both maize and tobacco were planted. Prices for maize and tobacco continued to rise. There was a great increase in mechanisation on farms.

2. In the Agricultural Department there was a notable increase in total staff through recruitment, but the shortage of fully qualified agricultural and research officers continued to hamper its work. Progress can be reported in respect of some development and welfare schemes. An Agricultural Training School for Africans was opened at Monze and the first students are now being trained there. The new tobacco station at Choma produced its first crop. The Agricultural Officer posted to Barotse-land was joined by an Agricultural Supervisor, and investigation of agricultural conditions was made on which a programme of development for that area can be based. A Provincial Agricultural Officer was posted to Broken Hill in the Central Province and to Kasama in the Northern Province to direct and expand the activities of the department in those provinces. Agricultural Officers were posted to Fort Rosebery and Lundazi and Agricultural Supervisors to Namwala and the South Chewa Reserve to initiate work in these areas. The Natural Resources Committee completed its task of drafting the Natural Resources Legislation, and a quantity of heavy earth-moving equipment was assembled during the course of the year for soil conservation work in the railway farming belt. The Improved African Farmer Scheme, which has been in operation in the native maize-producing areas of the Southern Province since 1947, was revised so as to encourage the adoption of a more advanced farming system than that originally contemplated. The department assisted in establishing further peasant farming groups in certain areas.

AGRICULTURE IN THE TERRITORY.

Maize.

3. In spite of an increased acreage planted to maize on the European farms there was a sharp fall in production because weather conditions were unfavourable. Lack of rain in the early part of the season impeded planting operations and adversely affected the growth of the crop. The acreage planted on European farms increased to about 74,000 acres but yield per acre was well below that of the previous season. Production on European farms is still expanding, over 100,000 acres having been planted by the end of the year for next year's harvest. There was a heavy fall in the quantity of maize marketed by African growers in the maize control scheduled areas. This crop, grown by small peasant producers who consume a large proportion of what they reap, is naturally very sensitive to adverse climatic conditions.

4. European farmers sold 283,000 bags of 200 lb. to the Maize Control Board and retained 87,500 bags for consumption on the farms. Only 61,000 bags were marketed by African producers in the scheduled areas (which lie along the railway). This does not include production in other parts of the Territory, which is carried on by Africans and marketed at various scattered centres for local consumption. The only significant production outside the scheduled areas was in the Eastern Province, where only 31,000 bags came on the market for consumption within the Province and made it necessary to import the shortfall on requirements from the line of rail.

5. Production in the railway belt over the past six years, with figures showing the acreage and approximate average yields per acre on European farms over the past three years, are given in the following tables:

MAIZE PRODUCTION FOR SALE IN THE RAILWAY BELT.

(Thousands of bags of 200 lb.)

<i>Year of Harvest</i>	<i>European Grown</i>	<i>African Grown</i>	<i>Total</i>
1944 ...	212	115	327
1945 ...	273	202	475
1946 ...	268	172	440
1947 ...	190	54	244
1948 ...	343	296	639
1949 ...	283	61	344

ACREAGE PLANTED TO MAIZE ON EUROPEAN FARMS.

<i>Season</i>	<i>Acreage</i>	<i>Bags Reaped</i>	<i>Bags per acre</i>
1946-47 ...	55,889	281,368	5.0
1947-48 ...	65,800	435,000	6.6
1948-49 ...	74,040	370,500	5.0
1949-50 ...	105,000	for harvest 1950	

6. For maize sold in 1949, European producers were paid 27s. per bag of 200 lb. of maize (excluding the cost of the bag) delivered to the depots on the railway line, a rise of approximately 4s. per bag over the 1948 price of 25s. 8d. which included the cost of the bag. African growers in the maize control scheduled areas received 18s. in cash per bag (excluding the cost of the bag) at all buying stations in the scheduled area irrespective of distance from the railway. The full price of 27s. per bag was credited to the native maize pool, the balance remaining after paying the cash price of 18s. and the cost of transport and handling between the buying depots in the native areas and the Maize Control Board depots on the railway being paid into a fund for the improvement of African farming in the scheduled areas.

7. Rationing of maize and maize meal was continued, and over the Maize Control Board Pool Year, from June, 1949, to May, 1950, which is roughly the period during which the crop reaped in 1949 is consumed, requirements are estimated at about 660,000 bags of which 45,000 bags are for famine relief in rural areas. Approximately 250,000 bags were imported during 1949: in addition 85,000 bags of cassava meal were imported to supplement the maize ration. Prospects for next year are very much better and it is expected that all requirements for maize during 1950 will be met from local production.

8. The stage has been reached now where production in a good year will be more than sufficient for requirements, but if Northern Rhodesia is to be self-sufficient in all years, adequate and improved storage facilities must be provided to store the carry-over from the good years. Storage facilities for grain are very poor. During the year the Territory was visited by Mr. T. A. Oxley of the Department of Scientific and Industrial Research in the United Kingdom, who examined such grain storage facilities as there are in the Territory and advised on their improvement and expansion. In the Eastern Province, which is not a scheduled area, the price offered to African maize growers did not exceed 10s. 6d. per bag. Supplies obtainable locally fell so far short of requirements that some 22,000 bags of maize had to be imported from the line of rail.

Wheat.

9. Wheat production, which has declined sharply since 1946, almost vanished in 1949. It is an irrigated crop demanding more skill, supervision and labour than maize, and a revival cannot be expected until the local maize market becomes saturated; an event which may not now be very far away. Shortage of water for irrigation further discouraged production, and only 1,470 bags of 200 lb. net were sold.

Beans, Groundnuts and Cowpeas.

10. The local production of beans, groundnuts and cowpeas is far below requirements even in a good year and production in 1949 was seriously affected by drought. Only 1,323 bags of groundnuts were sold by the Petauke Producers' Co-operative Society of African growers in the Eastern Province, who had sold 6,000 bags in the previous season. The department is most anxious for production of this valuable crop to be expanded.

Tobacco: Eastern Area.

11. The tobacco crop in the Eastern area turned out surprisingly well considering the vagaries of the rainfall. At Fort Jameson, 4,076,290 lb. of flue-cured leaf were sold over the auction floors for an average price of 32.471 pence per lb. Tobacco for the South African duty-free quota averaged 45.14 pence per lb. and the rest of the crop 31.197 pence per lb. On 144 registered farms, 8,222 acres were planted, yielding an average of 495 lb. of cured leaf per acre. The crop exceeded that of the previous season by over a million pounds and is a record for the area. Planting was delayed in the early part of the season by lack of rain and was continued as late as early March. The most popular varieties were Bonanza, White Stem Orinoco and Willow Leaf.

12. Air-cured Burley tobacco realised good prices on the auction floors but production increased very little above that of the previous year; 178,767 lb. were sold for an average of 30.198 pence per lb. Most of this was produced by African growers in Petauke district who marketed their crop through the Petauke African Tobacco Growers' Co-operative Society, which sold 150,221 lb. of leaf. Production has started in a very small way in the Luangwa valley, but the quantity of leaf sold was negligible. One hundred and thirty acres of Burley and 270 acres of sun-cured tobacco were planted on European estates. No Turkish tobacco was grown except for a very small plot on one of the agricultural stations.

Tobacco: Western Area.

13. Although the tobacco crop in the Western area went through much the same vicissitudes as that in the Eastern, it turned out to be a record for the area. On seventy-eight farms, 1,691,597 lb. of flue-cured leaf were produced from 3,240 acres, and sold for an average price of 31.5 pence per lb. The average yield was just over 520 lb. per acre. Production is expanding rapidly and the acreage planted for the 1950 harvest was almost double that of the previous year. Turkish tobacco continued to decline and only 97,000 lb. were sold at an average price of about 34 pence per lb.

14. The flue-cured Virginia tobacco industry, which began to expand about the end of the war after a long period of stagnation, is now growing fast. Production in both the Eastern and Western areas each year since 1944 is shown in the following table:

TOBACCO PRODUCTION.						
(Virginia type, flue-cured leaf in lb. weight.)						
Year	<i>Eastern Area</i>			<i>Western Area</i>		<i>Total</i>
1944	...	...	...	2,058,000	240,000	2,298,000
1945	...	...	...	2,207,000	243,000	2,450,000
1946	...	...	...	2,823,000	307,000	3,130,000
1947	...	...	...	2,928,000	500,000	3,428,000
1948	...	...	...	2,988,000	781,000	3,769,000
1949	...	...	...	4,076,000	1,691,000	5,767,000

Potatoes, Vegetables and Fruit.

15. The potato crop was severely affected by drought and there was for many months an acute shortage of potatoes. Lack of facilities for storage, to which attention was drawn in the Department's Annual Report for 1948, continues to hamper the expansion of production which could otherwise take place.

The Red Locust.

16. There was no report during the year of red locusts outside the outbreak areas which are controlled by the International Red Locust Control Organisation.

WORK OF THE DEPARTMENT.

Staff.

17. During the year the staff was increased by a Senior Agricultural Officer (transferred from British Somaliland), three Agricultural Officers and fifteen Agricultural Supervisors (one of them a woman). There were increases also in the African staff mainly in the ungraded category. Expansion of the graded African staff will begin towards the end of 1950 when the first students from the Agricultural Training School will become available.

The Groundnut Project.

18. The groundnut trials initiated in the 1947-48 season were continued at some of the sites to find whether there is any truth in the belief that groundnuts planted on the same land for two consecutive seasons fail in the second year. At Mpongwe in the Western Province there was a very marked decline in yield, apparently as a result of wilt disease.

19. A pilot scheme was planned and approved by the Legislature for the mechanised production of groundnuts in a 1,200 acre block of uninhabited Native Trust Land in Mumbwa district. Clearing will begin in 1950 and it is expected that when the scheme is in full operation there will be about 400 acres under groundnuts each year, the remainder of the land being under rotational grass leys and other crops as experience and trials dictate. Beef cattle will be reared on the scheme.

Rice.

20. The season 1948-49 was a bad one for rice because of drought. Interest is being stimulated in this crop in the Barotse Plain area, where seed was imported from Angola and distributed to 1,500 African growers; in the Bangweulu Swamps area where the distribution of seed has been organised; and in the Eastern Province where instruction and assistance is given by the staff of the department in terracing rice gardens and making small retaining banks to keep the water on the land. This work, which is meeting with much success, is to be extended. Two Agricultural Officers visited the rice growing areas of Tanganyika Territory to study the methods used there and especially the use of dams for supplementing rainfall, nursery planting and the use of contoured bunds to retain rainfall. The information gained was of considerable value and the Tanganyika methods are now being applied in some areas.

Oil Palms.

21. During the year, further investigation of the possibility of developing a small palm oil industry in the Luapula valley was made. Mr. Watterson of the United Africa Company made a detailed inspection of some of the suggested localities for production, and gave his opinion that a small peasant industry might be possible if rainfall is supplemented by irrigation. Ideal climatic and other conditions suitable for the cultivation of oil palms are not to be expected in Northern Rhodesia, but oil palms occur in several places and if only a small industry can be established it would be valuable to provide red palm oil for nutritional purposes.

EUROPEAN AGRICULTURE.

General.

22. The expansion of European farming continued, and record acreages of maize and flue-cured tobacco were planted in the closing months of the year. In the Central Province, where there are now over 350 farmers, a Senior Agricultural Officer and a Tobacco Adviser were employed exclusively on advisory services. In the Southern Province, with 250 farmers, the Senior Agricultural Officer at Choma and the Agricultural Staff at Kanchomba, Monze and Magoye gave assistance. In the Eastern Province, which has now over 150 registered tobacco farms, an Agricultural Supervisor was employed exclusively on advisory work. Both he and the Provincial Agricultural Officer at Fort Jameson were engaged also on demarcating farms in a 75,000 acre block of Crown Land set aside for European settlement by the Land Commission in 1942. In the Copperbelt there are about 100 farmers, many of them being part-time farmers and holding 300 acres or less; the Provincial Agricultural Officer and Agricultural Supervisor at Ndola provided advisory services for them.

23. Considerable progress was made in the mechanisation of farming during the year. By the end of the year it was estimated that there were 650 tractors on farms. Both tractors and implements are now in fairly good supply. Interest in mechanisation has been stimulated among the farmers by the shortage of African labour which is now becoming the most important limiting factor to further expansion of the European farming industry.

24. Tobacco growing expanded considerably during the year in spite of adverse weather conditions, and as many growers are new to tobacco planting the advisory staff was kept busy, both in the railway belt and in the Eastern Province. Tobacco was on the whole of good quality, but there is no doubt that inferior leaf is being produced and marketed in quantities that would embarrass the industry should the market become a little more discriminating than it is at present.

Soil Conservation.

25. The layout of soil conservation works occupied as usual a prominent place in the extension work of the departmental officers. Contour ridges were demarcated on over 1,000 acres in the railway belt and on 800 acres in the Eastern Province. The assembly of heavy equipment for the mechanical construction of soil conservation and irrigation works proved to be a slow undertaking, but by the end of the year most of the necessary equipment had been acquired and plans made for the operation of three units in the main farming belt on the railway line to begin in 1950.

AFRICAN AGRICULTURE.

General.

26. Although the staff of the department is still short of that required to give adequate attention to native agriculture throughout the Territory, much progress was made during the year in expanding it so as to provide more assistance than was possible in the past. There is now agricultural staff in each of the six Provinces. In the Eastern, Western, Northern and Central Provinces there is now a Provincial Agricultural Officer at the Provincial Headquarters to co-ordinate the agricultural programme for the Province.

Peasant Farming Scheme.

27. The three groups of peasant farmers which have been established in Serenje district are now well established and most of them have ten acres under cultivation. The cost of preparing the holdings (stumping, soil conservation works, cattle kraals, water furrows etc.) was about £60 per holding exclusive of the cost of survey and layout, roads and agricultural extension work which has amounted to a further £20 per farm approximately, and it is estimated that the total outlay incurred during the first five years on these farms will be about £120 per holding. This is to be repaid by the farmer over the second five years. It is clear that the success of the scheme will depend to a great extent on the development of efficient marketing arrangements for the disposal of produce, as well as on the co-operation that can be obtained from the peasant farmers and the adoption of sound agricultural methods. Two further groups are in process of being established.

28. In the Katete area of the Eastern Province the original ten peasant farmers have successfully completed their third year, and two more groups have been established. The crop rotation differs from one group to another. One group has holdings of twenty-five acres each, cultivated on a five-course rotation, giving fifteen acres of crops (maize and groundnuts) and ten acres of grass fallow. The second group consists of eighteen-acre holdings on a six-course rotation, giving nine acres of crops and nine acres of grass fallow. The third group is similar to the second, but with twenty-four-acre holdings, giving twelve acres under crops per holding.

29. In the Northern Province, one group of ten peasant farmers has been established outside Abercorn, and further groups are being started near Kasama (where special attention will be given to vegetable production), Chinsali, Luwingu and Mporokoso. The peasant farmers at Shiwa Ngandu have been established for some time.

Agricultural Training.

30. The Agricultural Training School at Monze was opened in the middle of the year with thirty-six students drawn from all six provinces, reduced after a few months to twenty-three men. The school buildings, which had been started late in 1948, were virtually completed during 1949 and a satisfactory borehole for the water supply was provided. All the students had spent a preparatory period of a few months at agricultural stations before coming to the school to test their suitability for agricultural work, and there is no doubt that wastage would have been considerably higher but for this. The course comprises classroom instruction and practical work both on the school farm and in the adjoining African areas, and will last eighteen months. A minimum educational qualification of Standard VI is insisted on to ensure as far as possible that progress is not retarded for lack of adequate general education. One or two students have entered with Standard VIII qualifications; this is an encouraging sign, for agriculture has not in the past drawn the more educated section of the African population and it is very necessary that it should do so.

31. In December, a further twenty-five students arrived, drawn mainly from the Southern and Central Provinces which the school is intended primarily to serve, but including a few from the Western and Barotse Provinces. The Monze School is therefore now fully established, with two classes, one of twenty-three and one of twenty-five. The Monze School itself will produce the first of its graduates at the end of 1950. Most of them will be absorbed into the department as Agricultural Assistants, but it is not intended to bind them to enter the department, and indeed, it is hoped that when the most urgent requirements of the department for staff have been met, some of them will look to farming, either on their own account or in the employment of European farmers, for their careers.

32. Construction of two further schools, one to serve the Northern and one the Eastern parts of the Territory, was begun during the year. The Katete School in the Eastern Province is expected to open early in 1950. The Lunzuwa School in the Northern Province will probably not open until towards the end of 1950.

DEVELOPMENT OF AFRICAN AGRICULTURE IN THE PROVINCES.

Southern Province.

33. The planting season of 1948-49 was very bad, and along the maize belt favourable planting rains were almost entirely absent during December and January. Serious fears of universal famine were justifiably aroused. Fortunately, however, the situation improved, and fair rains fell during February and March. There was some carry-over of grain from the previous year and although a

shortage of maize did indeed ensue, it was not nearly as bad as was expected, and the African villagers contrived to pull through without serious privation. The months of November and December, 1949, were favourable to the early planting of maize and other food crops.

34. The policy regarding soil conservation in the maize belt has been changed as it is found that large contour ridges are not essential except on the steeper slopes, their construction requires a large labour force and the total area protected thus becomes limited by supplies of labour. The number of ridges constructed annually and the areas protected declined seriously. A system of establishing contoured grass strips has been introduced successfully in the Kanchomba area which is now being extended to other areas and will result in the more rapid expansion of conservation work over a much larger total area; contour ridges will be constructed on the steeper slopes where grass strips are inadequate.

35. The Improved African Farmers' Scheme made further progress during the year, as the following figures show:

			<i>No. of Improved Farmers</i>	<i>Bonus Paid</i>
Monze	...	...	171	£2,228
Kanchomba	...	...	152	£2,195
<i>Total</i>	...	...	323	

It was decided to alter the terms of qualification, because, although the existing terms were a big improvement they were not good enough to preserve the fertility of the soil. Accordingly, the conditions were altered so that not more than half the total area farmed would be under maize in any one season, the other half being under legumes. Two grades of Improved Farmers were instituted, the first grade being required to apply a minimum quantity of artificial fertilizer and to plough under a minimum area of green manure in addition to the other terms for qualification. There was a good deal of dissent amongst the Tonga farmers over the new terms for qualification. However, the new scheme was carefully explained to them, and at the end of the year, 250 farmers had registered as Improved Farmers. A good proportion of these farmers will qualify for bonuses. It is felt that this scheme is now proceeding along sound lines and with reasonable speed. That so many African farmers have agreed to plant a green manure crop and plough it under is a big step forward. The actual control of erosion, and the use of kraal manure is far more widespread than indicated by the number of Improved Farmers.

36. The Mbiya settlement referred to in paragraph 77 of the Report for 1948 has proved a failure and financial help has been withdrawn. Ten of the settlers, however, have since been registered as Improved Farmers.

37. In an endeavour to provide some reserves of food in case of famine, an energetic campaign to stimulate the universal establishment of cassava was started throughout the Province. Although this was originated by the Agricultural Department, it has been taken over by the Native Authorities. Cassava nurseries have been established in the areas of every district headman or sub-chief, and Native Authorities' orders have been introduced to ensure increased planting of cassava. It will take some years to supply cuttings for the entire Province, but if the present energetic pressure can be maintained, sufficient progress should be made towards the establishment of adequate reserves of food and planting material.

38. For the first time, an Agricultural Supervisor has been stationed at Namwala, and although there is no concrete progress to report as yet, the district has considerable agricultural potentialities which it is hoped will now be developed. Mapanza and Macha areas are now administered from Namwala, and efforts are being made to get the Improved Farmers' Scheme adopted there and some encouragement given to attracting cultivators into these areas from the overcrowded areas nearer to the railway.

39. Some three years ago active encouragement was given to the establishment of school gardens, and oxen and implements were issued to many schools. Unfortunately most reports indicate that the response has been very disappointing.

Eastern Province.

40. The 1948-49 season was remarkable for the light, and ill-distributed rains which reduced crop yields throughout the Province. As invariably happens, flue-cured tobacco turned out better than might have been expected in view of the difficulties of the growing season, but food crops suffered seriously. Famine relief measures had, in consequence, to be undertaken in certain areas, and the general shortage of food, especially of relish, has been felt throughout most of the Province. Precautionary measures were taken to reduce risk of famine. Short term yellow maize seed was imported, and arrangements were made to plant up all available areas to food crops as soon as the rains came. However, because of the failure of the rains it was found necessary to import some 22,200 bags of maize from Lusaka in order to make up the shortfall on provincial requirements. Groundnuts, beans and cowpeas were all in very short supply, the reduction throughout the Province being in proportion to that suffered by the Petauke Producers' Co-operative Society, which sold only 1,323 bags of groundnuts in 1949, as compared with 6,030 bags in the previous year. Yields of rice were very poor throughout the Province because of lack of water; only 149 bags were sold. Quite extensive areas of rice were planted up by the end of the year, and they appear to promise well, except for parts of the valley where the floods have washed away the crops. One hundred and eighteen cotton growers sold 7,453 lb. of seed cotton as compared with the previous year, when fifty-nine growers sold 2,702 lb; most of the cotton crop had to be replanted at least three times, due to poor rains.

41. The Petauke African Tobacco Growers' Co-operative Society sold 150,221 lb. of Burley tobacco, and the Kunda Valley Producers' Co-operative (twelve members) sold 242 lb. Prices for Burley tobacco again compared very favourably with flue-cured on the auction floors, but there was little increase in the total offered over the previous year.

42. An African Agricultural Show was held at Katete Agricultural Station under the auspices of the Development Team, and proved very popular and useful. It is hoped to make this an annual event.

43. Contour ridging continues to be the first essential undertaking when any new area comes under control. Conversion to ridge cultivation over a period of three years is now required when contour ridges have been marked, but there are certain areas where, owing to former agreements, mound cultivation is still allowed between conservation ridges. The number of villages now brought under control is 864. Of this total over 300 were marked for contouring during 1949. These efforts are being followed up with measures towards improved agriculture and the introduction of more varied cash crops. To alleviate the famine threat, permission was given in January to waive some of the restrictions on dambo and streamside cultivation. These restrictions were, however, reinstituted at the end of the year.

44. The ten "peasant farmers" at Katete are now in their third year, and except for two or three they have done very well. They are using the five-course rotation, groundnuts, maize, groundnuts, grass, grass on five-acre plots, making a total of twenty-five acres of which fifteen are under cultivation in any one year. These men are very loath to share implements as was the original intention.

45. A second block of peasant farms was laid down at Walubwe, not far from Katete, early in the year, but two or three of the farms remain to be taken up; they are smaller than those at Katete and a simple rotation of three years cropping and three years grass is being followed. Eighteen acres is the full extent of each farm, nine acres only being under cultivation at any one time. It is possible that a normal family could keep more than nine acres under cultivation.

46. A third block of farms was laid down at the end of the year near Sinda Stop on the Great East Road. This too is being cultivated on a simple rotation with twelve acres under crops at any one time. It is felt that a start must be made in putting the production of maize on an economic footing in this Province instead of leaving it entirely to hoe cultivators. Some economic incentive must be given.

Petauke.

47. The three Native Authorities in Fort Jameson district have lately passed adequate orders controlling the growing of rice. Records show that there are now 193 owners of ploughs in Petauke district and all gardens are being inspected to ensure compliance with conservation orders. The Nsenga Native Authority Farm was started during the year. A five-course rotation was adopted as follows: tobacco (composted), bulrush millet or kaffir-corn, groundnuts, maize (with compost), and beans or cowpeas. A four years' rest will probably be necessary.

48. The Petauke Co-operative Marketing Union Ltd. was registered late in the year. The two foundation members of this Union are the Petauke African Tobacco Growers' and the Petauke African Producers' Co-operative Societies. These organisations now employ two whole-time Europeans. A second tobacco station has been built at Chilwa, between Petauke and Minga. This station should be able to handle 80,000 lb. of tobacco in 1950, and double that amount in 1951. Some famine relief was undertaken in the district.

Katete.

49. For geographical reasons, the activities of the Development Team have been mainly concentrated in this area. They are concerned with three peasant farming units as follows: The Chimwala-Kakula Producers' Co-operative in Kathumba's district, the Kafumbwe Producers' Co-operative which will deal mainly in rice in Kawaza's district and the Nyamadzi Producers' Co-operative near Sinda Stop.

50. There are now probably 250 ploughs in this area, many of which are intended for rice cultivation. Many village areas have been grouped into parishes.

Kalichero and Luangwa Valley.

51. The Kunda Valley Producers' Co-operative was registered during the year; 2,700 lb. of cotton lint was sold and 242 lb. of tobacco. The weather was very discouraging. New premises were built at Musumba beyond Jumbe which are intended to deal with upwards of five tons of tobacco leaf in 1949-50 and ten tons eventually. The Society is paying all expenses on seedbeds in 1949-50 and will also meet handling charges. Surplus cotton seed is being fed experimentally to cattle on the plateau. It is hoped that cotton growers will increase from 118 to 350 in 1949-50. Growing is being extended to Kwambiri's country. Nine new villages have been resettled in the Kalichero area, six of them forming a parish.

52. Rice gardens were prepared but seed arrived too late for plateau planting.

Mshawa's Area.

53. As an experiment a Woman Agricultural Supervisor was stationed in Chief Mshawa's area in order to carry out soil conservation measures and agricultural development through an approach to the women, who, in this Province, do most of the hand cultivation. The results have been gratifying, and it is hoped to expand the experiment.

South Chewa.

54. This district is administered from Chadiza, the new sub-Boma where there is a District Officer and an Agricultural Supervisor who work in close contact. Work in the district at first followed the recognised lines, but planting up of resting gardens with velvet beans was tried. It is intended to investigate fully the possibilities of regeneration under grass in this eroded reserve, through a system of alternating husbandry with grass leys of varying duration.

55. Contouring of certain abandoned land was undertaken. Cultivation by implements is confined to the small Agricultural Station for the present, as there is no hurry to extend the use of ploughs in the district, as the problem is largely one of land hunger. A demonstration centre has been started in Chipili Parish where rice growing is being demonstrated with the aid of a horseshoe dam. The planting of food and cash crops as alternatives to maize is being encouraged.

Ngoni Reserve.

56. It has not been possible to station a European Officer for work in the Ngoni Reserve, large areas of which are over-populated and badly eroded. The Kanyanja Parish continues on a fifty-fifty basis, that is to say cultivation is confined to one half of the area, then after three years all gardens are shifted to the other half, and so on. To begin with, natural regeneration is being tried and composting is encouraged.

57. A stream near Fort Jameson was inspected for its irrigation possibilities, which might allow organised vegetable and fruit production for the Fort Jameson market. There are forty plough owners in the Ngoni Reserve, nearly all of them are applying compost. Conservation work was continued in the densely populated Chiparamba Reserve.

Northern Province.

58. The Province received only three-quarters of its normal seasonal rainfall and this was so badly distributed that some crops were severely affected. Kaffir-corn suffered from an exasperating sowing season. Legumes, particularly beans, were very largely a failure and the early crop almost a total failure. The millet crop was generally very patchy, reflecting the nature of the local rains. The main sowing time in late December was marked by two spells of rain, one just before Christmas, 1948, and one just after. Those villagers able to plant their crops during one of these spells obtained fair crops, while others being so upset by the unusual weather failed to catch these spells, suffered a severe reduction in the yield of their staple crop. The perennial sorghums, which are customarily sown in the *Chitemene** circles with the millet, yielded well and provided a valuable harvest to augment the staple crop. Cassava made poor growth during the season and some villages struggled hard to achieve the planting of the requisite area required under Native Authority Law for the current season. Rice was a failure in many areas, particularly Isoka District and in the Luvu Valley of Abercorn District. More sweet potatoes were planted than in a normal year following propaganda by the Agricultural Department and Provincial Administration.

59. The administration of the "*Chitemene* Control" scheme continued to devolve on this department. Most of the villages in the scheme were visited by European staff during the year. Woodland for *Chitemene* was rationed more severely and those villages which have exhausted the suitable woodland were confronted with the need to change over to digging on a much bigger scale. No extensions were made to village areas for *Chitemene*, and remaining unoccupied blocks in the control areas were made available, in co-operation with the Provincial Administration, only to villages who agreed not to practise *Chitemene* but to dig for their food.

Soil Conservation in Native Areas.

60. The year was marked by a considerable expansion in soil conservation work in the Abercorn and Isoka Districts. All cultivated gardens in the *Chitemene* Control areas were visited and contour bunds re-surveyed and extended where necessary. The villagers themselves were responsible for digging the bunds and in general complied with instructions.

61. In the Mambwe Reserve 4, where erosion is serious, work was extended, contours being pegged in all village gardens, and in all new millet lands. Single bunds at a vertical interval of three feet were dug by most villages, although there were some cases of removal of contour pegs and refusal to comply with orders. At the same time, the area of former Chief Kela was included for the first time and demarcation of contours on a similar basis carried out.

62. Work was also extended for the first time to Wayitwika's Reserve in Isoka District, where the nature of the country and the degree of deforestation calls for strong measures. This area lies outside the *Chitemene* Control scheme. The area was thoroughly toured by European staff and all the village gardens throughout the area demarcated with contour bunds on a three feet vertical interval by African staff. African staff have been posted to the area to maintain this work and ensure the digging of the ridges.

63. Demonstrations of the conservation of gardens and headwaters of streams were laid out at Nondo and the Kafula stream, at Lunzuwa on the Miyemba stream, at Sikalembe village and the Kayengele stream, and at Mpande in the Abercorn District and at Tunduma in the Isoka District. The District Commissioner, Isoka, has also carried out much valuable demonstration conservation work, both at the Boma and in the district with the assistance of departmental African staff. Other conservation measures included the early burning of native areas in Abercorn and Isoka Districts, and the protection of streamside vegetation. The two districts are served by the Lunzuwa Agricultural Station and five satellite seed farms in Abercorn District, and three in Isoka District. Extensions were made to the acreages of these with the object of supplying more seed and planting material. New fields cleared at Lunzuwa amounted to eighty-seven acres. Rice gardens, nurseries to supply fruit trees, and model orchards have been laid down at the seed farms.

64. A group of African farms have been established with the aid of Development funds at Mwambala in the Abercorn District. These are progressing slowly but satisfactorily, and should pioneer the way for future expansion of this type of holding. The Mambwe villager, who is the subject of this experiment, is requiring considerable assistance to make him into a farmer. At present there is not much active interest in the scheme, and of twenty farms demarcated only ten are occupied.

* *Chitemene*. A native system of growing millet (*Eleusine corocana*) in which the axe is the only implement used. Trees or lopped branches are dragged into heaps and burnt. Millet seed is later broadcast and brushed into the ash at the onset of the rains.

65. The peasant farms in the Kasama area were under the supervision of the District Commissioner (Development) Kasama, who was responsible for their inauguration. However, during the latter part of the year, departmental officers stationed in Kasama were able to take an increasing interest in this work and regular visits were paid by both African and European staff from September to the end of the year.

66. Advisory visits have been made during the year to the Shiwa Ngandu Peasant Farming Group.

Rice.

67. In order to encourage and increase rice production in the Bangweulu area, a scheme for the controlled distribution of rice seed was carried out. Five areas were chosen as being the most suitable centres of distribution. The islands of Chilbui, Chishi and Nsalushi were included in this rice seed distribution scheme and which will be extended in 1950.

68. A large number of rice observation plots have been established in school gardens and seed farms.

Agricultural Education.

69. For some years, Senga Hill School has been training teachers in practical agricultural education, and they have been doing valuable work in disseminating improved agricultural methods in the schools of the Northern Province. Plans of a six and seven course rotation have been produced and sent out to all schools (and peasant farmers) in the Province. It is hoped that during 1950, further propaganda in the form of posters and booklets will be prepared as a "follow up" to stimulate the interest of local food producers.

70. A course for Native Authority Agricultural Kapasus (messengers) was held in Lunzuwa in June at which forty-one attended. Further courses for Kapasus, and the newly elected agricultural councillors are proposed for 1950 at Kasama and at Lunzuwa. The first of what is hoped will be a series of courses for women teachers on agricultural methods was held in Kasama in November. Lectures and demonstrations were given by officers of the Agricultural Department and visits were arranged to the new demonstration farms in the Kasama area.

71. Soil surveys on transect lines over distances totalling about 250 miles were made in the Abercorn and Isoka Districts. These indicated that approximately fifteen per cent. of the total land surface is suitable for permanent agriculture. The results of these surveys corresponded closely with the findings of the Morrison Expedition which spent two weeks at Lunzuwa in October–November.

Central Province.

72. The new Provincial Headquarters at Broken Hill for the Central Province were opened in September, 1949. Hitherto, agricultural work in this Province had been confined almost entirely to the Lusaka Agricultural Station under the Senior Agricultural Officer and served only the European farming community in the districts along the railway line.

Mkushi.

73. There are four African agricultural "Demonstrators" who work under the Native Authority. These men have done good work in controlling *Chitemene*. They have also encouraged the extension of the kaffir-corn gardens, and the growing of cassava, sweet potatoes, groundnuts and other crops. Seed selection and keeping good seed has been preached in most villages, also the practice of early burning. This district has been well prepared for an extension of agricultural work.

Mumbwa.

74. The Mumbwa District forms the centre and pivot of the proposed Kafue–Lukanga Development area. The area consists of the comparatively rich soils along the Kafue and its lagoons and arms, also the extensive grazing grounds on the Flats. This type of country extends across the Kafue into the Namwala District. Adjoining the Mumbwa District on the north and north-east (the western portion of the Broken Hill District) are some large fertile areas which merge into the Lukanga Swamps, the agricultural possibilities of which are at present little known. Agricultural staff will be posted in this area in 1950.

Serenje.

75. Work on the three established Peasant Farm Groups—Lumpampa, Milembo and Bulila—was continued. During 1949, the farmers did practically all the work, only being given assistance in contouring the land and guidance in ploughing.

76. A certain amount of work was done on the other two groups, the sites of which had been chosen towards the end of 1948—Sasa and Musola—but owing to shortage of labourers, due to scarcity of food it was not possible to establish these farms as was intended. The stumping and the clearing of the land continues to be a comparatively costly item, and experiments are still being made with a view to reducing these costs. The "kraaling" of the cattle at the farms during the three wettest months of the year—January, February and March—is a cause for anxiety. Various suggestions are being tried out in an effort to find a solution to this problem.

77. The soil erosion methods adopted at the farms seem to be satisfactory and very little erosion has taken place. The soils are sandy, and allow the water to percolate, but the long flat ridges dug on the contour, at intervals of approximately forty-four yards, with a vertical interval of about two feet six inches, have held up any excess of rainfall. It may be necessary for the farmers to put in some smaller ridges across the centre of some of the steeper plots near the stream.

Serenje Agricultural Station.

78. Considerable progress was made at the new agricultural station both in clearing and planting, and with the building programme. The furrow from the Kapanda stream was dry by June and it was with great difficulty that the flow was maintained in the furrow from the Chililabombwe stream. The station has been laid out on the contour, with the main roads running along the contour. Most of the roads have been stumped and cleared. The total area demarcated is approximately sixty acres, and it will be possible to extend if necessary. Thirty-two acres were planted to various crops in 1949.

79. A dam across the Kapanda stream is almost completed, and this will give a permanent water supply. It is proposed to dam the Chililabombwe stream, and later the Ibolelo, so as to ensure a constant flow for irrigating most of the arable land, and under normal conditions the whole station should be well supplied with water.

80. The 1948-49 rainy season, here as elsewhere, was exceptional. The rainfall for the season was only twenty-nine inches, instead of the average forty to forty-five inches. The season as far as rainfall and crop yields were concerned was the worst known for a generation and the harvest was an extremely bad one, and very little surplus food was available.

Barotse Province.

81. Assisted by an African assistant surveyor and an African research assistant, the Agricultural Officer was engaged in a survey of native agriculture from June onwards. At the end of the year the survey was still in progress. In addition, short reconnaissance surveys were carried out in areas outside the sphere of influence of the Development Centre and also in parts of each of the five districts of the Province and in Balovale District. A visit was also paid to Angola to observe something of agriculture in that territory.

82. An agricultural station was opened at the Development Centre on land granted by the Barotse Native Government for the purpose. The more important lands of agricultural promise are situated on the flood plain and on its immediate edge. Survey and soil reconnaissance preceded the request for the area granted. In addition, a small plot of land was granted, six and a half miles from the Centre, where there are two soil types not found at the Centre.

83. The agricultural station site comprises 270 acres on the Barotse Plain adjoining the Development Centre and four acres on the Central Bulozhi Plain near the river, together with areas as yet undetermined, on the high bush-covered land at the Centre.

84. The station lands comprise eight major soil types, most of which are found in two or more district variants. These soil types differ not only in their physical and in their chemical properties, but especially in the way they can be managed. They differ between themselves in their soil-water relations, and these vary seasonally for each soil type.

85. Investigations were started during the year to determine the best methods of draining the *Sishanjo** and various layouts of surface drains have been tried. In 1948, gauges were set up at various points on the flood plain to measure the depth of flood water over lands of present or potential agricultural importance, but little of value resulted because of the failure of the 1949 flood. In the light of later knowledge more gauges were set up in 1949, and in addition, small shafts sunk to measure the height of the water table on many sites on the agricultural area; results of interest are already being obtained.

86. Large areas in each district in the Province contain sites suitable for rice growing and the population to cultivate the crop on an appreciable scale. The need for an additional food crop is pressing and the use of rice enables land too wet for maize to be utilised. The need for an exportable crop is also great, and as far as one can judge, rice could be profitably exported to the line of rail at present prices. Observation and inquiry in Angola showed that a rice variety suitable for milling for export and grown under conditions approximating closely to those in Barotseland was available. For these reasons Angolan paddy was imported and distributed, without the necessity for preliminary trials at the agricultural station. The importation of twenty-five bags was arranged, the greatest quantity that could be planted in 1949. Unforeseen difficulties in obtaining the paddy jeopardised the project at the start, but all the seed was distributed and, as far as is at present known, virtually all of it was planted, though of necessity much of it under unfavourable conditions. Though many of the individual plantings will undoubtedly fail due largely to careless and quick planting, often not by the methods explained to the cultivators, and on ill-prepared land, nevertheless the project itself may be said to have had an extremely successful start.

87. The rice crop has been introduced to a very large number of cultivators (over 1,500 in the sphere of influence of the Centre alone), 98 per cent. of whom had never planted the crop before. These will have gained the experience necessary to give the crop every chance of success next year.

88. In common with many other similar valleys in Central Barotseland, the Kataba Valley has had its natural drainage line canalised in the past in order to drain the seepage soils, and though from time to time this has been cleared out by Government, at the beginning of the year it was in its normal barely functional state. It is intended to develop the valley agriculturally as a Development Project, and the necessary preliminary, the clearing out of the canal, was completed under direction from the Development Centre. Land for long waterlogged and non-productive had become fit for cultivation at the end of the year, but at this stage it seemed that no agriculture other than the traditional should be encouraged, except that rice was distributed to the inhabitants at twice the rate distributed elsewhere.

Western Province.

89. Rainfall throughout the Province was well below normal; in Ndola for instance, the average rainfall is 45.5 inches, but during the 1948-49 season the total rainfall was 31 inches only. As a result of the failure of the rains, harvests in most districts were poor. Districts with cassava as their staple

* *Sishanjo*. The Barotse name for a spongy soil type inclined to water-logging.

suffered much less than those which depend on kaffir-corn. During November to March, the usual period of food shortage was more pronounced than in a normal season, nevertheless it would be an exaggeration to say that any district suffered from severe famine conditions.

Resettlement: Ndola District.

90. Although no further organised resettlement took place during the year, a population census showed that the total number of villages had grown from 172 to 186. Newcomers are therefore slowly infiltrating into the area. This census also gave the following interesting information:

		<i>No. of Villages</i>	<i>Men</i>	<i>Women</i>	<i>Children</i>
Chief Chiwala ...	...	51	396	492	855
Chief Mushiri ...	...	102	492	710	1,100
Chief Nkambo ...	...	33	172	239	420
<i>Totals ...</i>	<i>...</i>	<i>186</i>	<i>1,060</i>	<i>1,441</i>	<i>2,375</i>

These figures indicate only people who are permanently resident in the area and who actually cultivate the land. The total registered population figure is considerably more because the majority of the able-bodied young men prefer to earn the wages offered by the mines and other industry. For example the registered male population in the Mushikishi Parish is 287, of which 156 are not engaged in agriculture; of the balance of 131, fifty-seven are exempt from tax owing to old age or some physical defect, leaving seventy-four able-bodied men to till the soil. This example is an indication of what applies to the area as a whole.

91. Particular attention throughout the year was given to all villages in the resettlement area. All gardens have been satisfactorily contoured. The villagers themselves realise now that these banks are the most fertile parts of their gardens and good stands of maize and beans have been grown on the ridges. The habit of leaving these ridges unplanted in previous years has practically ceased.

Soil Conservation.

92. In addition to the intensive soil conservation work undertaken in the Ndola Resettlement area, soil conservation work was carried out in a number of mission and native authority school gardens in the Province. Soil conservation of a more general nature was undertaken throughout the Ndola Native Reserve; this consisted of the protection of headwaters and water courses, early burning and the prevention of late fires.

Improvement of African Agriculture.

93. Improved and selected seed of the common native crops was distributed on a fairly large scale, including distribution to the Native Authority and mission schools in the out-districts. This seed came from Kambowa and Nyenyeshi seed farms. Large quantities of sweet potato cuttings were also distributed in the Ndola Resettlement area.

94. There are four small fruit tree nurseries in the resettlement area, and the distribution of lemons, guavas, mulberry cuttings and mango trees continued. Towards the end of the year several consignments of trees were sent to District Commissioners in the western and north-western areas of the district.

Kambowa Agricultural Station.

95. Kaffir-corn crops on the station did well and the harvest was much better than from the surrounding countryside.

96. The varieties of dwarf American sorghums did not thrive under local conditions; under local conditions most varieties show a tendency of reverting to the tall species.

97. Groundnuts did fairly well considering the season. The crop would have been extremely poor had it not been for the late rains in April which helped to swell the nuts.

98. The observation plots of various grasses continued and the Giant Rhodes grass and Naivasha Star grass appear to give the best cover on these soils and are the easiest leys to establish. None of the grasses of a "tussocky" nature of growth have given adequate cover to the soil although Guinea grass and Napier grass have grown well.

Agricultural Education and School Gardens.

99. The school garden movement made considerable progress during the year throughout the Province. The enthusiasm of both school teachers and children in the Province for this work is increasing. Twelve new school gardens opened last year were supervised by this department; many others were opened up which it has been impossible to supervise adequately at present. Courses of instruction were arranged for Native Authority staff during July. Three teachers, two councillors and twelve junior Native Authority staff attended from Kawambwa, Mwinilunga and Solwezi districts.

Improvement and Introduction of Native Food Crops.

100. Attempts during the past six years to encourage the natives of Ndola District to produce more rice have proved disappointing despite the fact that there is a ready market for the crop on the Copperbelt and even in the reserve. In order to prevent damage by birds, the tendency is to harvest the crop green, with the result that the hulled product is extremely poor.

101. In the area adjoining the Copperbelt towns, the production of vegetables is increasing rapidly. At present, cabbages, carrots and tomatoes are most commonly grown. A considerable quantity of vegetable seed was distributed at cost price to these vegetable growers. The department exercised a certain amount of control over these vegetable gardens in preventing over-cultivation in close proximity to springs, headwaters and in seepage areas.

EXPERIMENTAL WORK.

LUSAKA GOVERNMENT FARM (CHALIMBANA).

Maize Trials.

102. The trials were practically ruined by the prolonged drought. In a comparison between Double Hybrid maize and Hickory King, the Hybrid gave the greater yield despite the unfavourable circumstances.

Wheat Variety Trials.

103. Due to the drought and shortage of irrigation water, only the smaller experimental lands were cultivated. Even this reduced area of wheat suffered to some extent in the later stages of growth, through scarcity of water. The year seemed particularly to favour Karachi, which gave excellent growth throughout. Karachi is a late maturing wheat with a serious susceptibility to leaf rust, but so far free from stem rust: it tends to a weak straw and is inclined to shatter. Further trials of it are indicated. Mentana also showed promise as another late maturing wheat, showing no inclination to shatter and less tendency to rust; this may yet prove a promising wheat. However, both these wheats have just been introduced and are still under trial. Of the forty-six selections from South Africa, numbers 30, 71, 72 and 75 seem the most promising over the two years they have been planted, and will be retained for further trial; they are showing remarkable freedom from all rust attack, fair strength of straw, and little shattering. Punjab 8A, which for many years has proved a promising wheat, did not do as well as usual but it is still recommended for rust free areas. Matopo and selected Red Klein Corn also continue to show great promise.

Dwarf Sorghum Varieties.

104. A trial of ten varieties of dwarf sorghum imported from South Africa was a failure on account of drought conditions, in combination with poor soil conditions.

Soya Beans.

105. A trial of seven varieties of soya beans failed on account of drought.

Fodder Crops and Grasses.

106. From the large number of fodder crops and grasses that have been tried out during the last three years, four promising varieties are now being established in experimental paddocks, both under irrigation and dry land conditions. This work was seriously checked in 1949 on account of the drought and consequent lack of irrigation water. The veldt management of each variety will be studied in the years to come. The most promising grasses are:

- (i) *Giant Rhodes Grass*. This is a promising grass and fairly easily established on most soils both under irrigation and dry land conditions. New leys can be controlled to give late hay cuts of about one and a half tons to the acre. Excellent hot season irrigation grazing has been obtained, but there is evidence of the older plots showing a decline in the fourth year.
- (ii) *Panicum Makarikari*. This variety has, unfortunately, to be established from roots, but when established does extremely well on most soils both under irrigation and dry land conditions. It gives an abundant growth of most palatable grass that can be cut twice during the year for hay. It also gives light grazing facilities during the dry season. Excellent grazing has been experienced under irrigation. It promises to be one of the most valuable grasses, but must be planted mechanically to establish large acreages.
- (iii) *Naivasha Star Grass*. This also has possibilities in the rotation, but it is more valuable as a dry land grass. It retains its nutritive value even when dry, and can be cut for hay at the end of the rains.
- (iv) *Setaria sp.* This grass shows promise under irrigation. It may prove to be one of the most valuable if we have success with a new variety that produces viable seed. Our existing varieties have all to be planted by roots and being a tufted grass it takes too long to cover the ground.

MOCHIPAPA TOBACCO STATION, CHOMA.

Seed Beds.

107. A nursery for tobacco seedlings was constructed in August, 1949; 4,050 square yards of beds were sown to Virginia varieties, and 1,750 square yards to Turkish varieties, each bed being twenty-five yards by three feet. Six varieties of Virginia tobacco were sown, Bonanza, White Stem Orinoco, Jamaica Wrapper, Willow Leaf, C/10 and C/7. Five beds of each variety were sown every seven days from 3rd October. Seven varieties of Turkish were sown in six weekly blocks, the varieties being Monopoly Soulouk, Maden, Dede, Djanik, Djanik Bald Jali and T.S.5.

Treatment.

108. Each bed was treated with a soil fumigant at 400 lb. per acre, fourteen days before the bed was sown. No beds were burnt off prior to planting, and compost was added as a top dressing. There was no sign of eelworm or any other disease during the nursery period, and plants were excellent. A fungicide was used as a spray against disease, applied weekly with a knapsack sprayer; unless carefully applied, burning of leaves results.

TOBACCO VARIETY TRIALS.

Virginia Type.

109. For the 1948-49 crop, two fields totalling sixty acres were planted with Virginia tobacco, comprising three varieties: Jamaica Wrapper, White Stem Orinoco and C/7, at twenty acres each, planted on ridges three feet apart with two feet between plants. All three sections were fertilized with

Virginia mixture, broadcast at 200 lb. per acre. During the later stages of growth two dressings of 50 lb. per acre each of fertiliser was applied per plot. Because of drought conditions, the growth of the crop did not come up to first expectations, and topping was done to leave approximately fourteen leaves per plant. There were no definite conclusions reached regarding the three varieties named above. Yield for the crop was 34,633 lb. baled weight, which realised an average of 37 pence per lb., giving a gross return of £4,387 14s. 5d. and £3,790 6s. net, after deducting grading and selling fees.

Turkish.

110. Only seven acres of a proposed twenty acres was planted in the 1948-49 season to this crop, mainly owing to the lack of rain. The growth was poor, and no conclusions could be drawn as to the relative value of the seven different varieties planted out. Varieties tried were Monopoly, Soulouk, Dede, Maden, Djanik, Djanik Bald Jali and T.S.5. The field was fertilized with Turkish mixture at a rate of 100 lb. per acre broadcast. The tobacco was planted on ridges eighteen inches apart and five to six inches between plants. The total yield was 1,869 lb.

111. For covering the curing racks, 24-oz. hessian was treated with a water repellent, and spread above the strings. This was effective against dew and very light showers, but anything from a half-inch of rain upwards easily penetrated the hessian.

Grasses and Cover Crops.

112. An eight-acre paddock was laid out to five varieties of grasses :

- (a) *Milanje Grass* : (*Digitaria sp.*). This was planted at the end of November, 1948, from roots and has done very well ; stock seem to like it. It withstood drought conditions during the year and is now flourishing.
- (b) *Giant Rhodes Grass* : (*Chloris gayana*). Seed was broadcast in November, 1948. The results owing to lack of rain were not good, very little germinating. Part of the above section was ploughed under and roots planted late in December, 1949. A further eighteen acres was planted from roots in field " A " at Mochipapa, which grew Virginia tobacco last season.
- (c) *Star Grass* : (*Cynodon plectostachyum*). Roots were planted in November, 1948 ; this did well throughout the year.
- (d) *Sabi Grass* : (*Urochloa mosambicensis*). A very small section was planted from roots in the paddock and did not do well at all. Four beds, twenty-five square yards were each sown with seed, broadcast, and this had good results. These beds were sown in the tobacco nursery with seepage conditions. In December, 1949, a plot in the paddock was planted from roots from the nursery and has done very well.
- (e) *Kudzu Vine*. Crowns from Southern Rhodesia were planted nine feet apart. The majority of the plants lived, but they did not flourish under these conditions. A handful of maize fertiliser was applied to each plant, and, because of lack of rain they were watered up to November, 1949, once a week, and have now been ploughed under and star grass planted in their place.

Barns.

113. Of the six barns built in 1949, three are of the Townsend type with air channels built into two walls and through the floor to allow for circulation of air currents throughout, and three are of the standard type used in Northern Rhodesia and Southern Rhodesia. During the curing period, February to April, careful records were kept of the curing times per barn. The following figures are average times as taken from each barn :

Townsend Barns :	
Curing times	Average 125.8 hours.
Drying out times	Average 31.5 hours.
Standard Barns :	
Curing times	Average 160.7 hours.
Drying out times	Average 60.7 hours.
Difference in time taken to cure ... 34.9 hours saved with Townsend barns per curing.	
Difference in time taken to dry out... 29.2 hours saved with Townsend barns per curing.	

It follows, therefore, that an average saving in curing time of 34.9 hours was effected by using the Townsend Barn ; thereby saving fuel and also reducing the number of barns required for curing a given quantity of leaf.

Motor Hoe.

114. This little implement, with its 1½ h.p. engine, was at first regarded as something of a toy, but when tried out on the cultivation of Turkish tobacco in eighteen-inch rows, proved to be ideal for the work, and covered all the cultivation requirements for that crop this season.

NORTHERN PROVINCE.

Lunzuwa (Abercorn).

115. The grass ley rotation experiment was modified so that comparisons will eventually become available between rotations involving two years of cultivation and six years of grass ley and seven years cultivation and two years grass ley, and all combinations between these extremes.

116. Fertilizer trials on the main soil types were laid down as follows :

- Lunzuwa on red earths.
- Nondo Seed Farm on poor plateau soil.
- Nsokolo Seed Farm on medium plateau soil.
- " Ntatumbila " on Acacia thorn transitional soil.
- " Mulanshi " on a " Chipya " soil type.

Maize, kaffir-corn and finger millet are being used as indicator crops at each centre.

117. Work on kaffir-corn was extended at Lunzuwa and twenty selections were grown from which further selections were made for trial in 1949-50. The Residual Compost Trial was continued for another year. Several new wheat varieties were tested for the first time at Lunzuwa.

118. By and large, the drought upset the wide range of experiments carried out at this station. However, the results may be summarised briefly as follows :

Potchefstroom Pearl maize variety proved the higher yielding as compared with Hickory King variety.

Legume crops in 1949 were generally a failure, but velvet beans yielded remarkably well.

Yields of second year cassava were particularly poor.

Yields of finger millet indicated that this crop requires *Chitemene* cultivation, or new land of good fertility.

Sunflower yields were one-third of last year's.

Of the wheat varieties, Kruger Bearded was the highest yielder, White Klein, Australian, Punjab and Balovale were the best of the other varieties tested.

White oats sown in January was heavily attacked by yellow rust and indicated the need to raise the crop under irrigation in the dry season.

On the seed farms, butter beans proved superior to other legumes.

Kaffir-corn yields were affected throughout by severe attacks of smut ; the average yield for the seed farms was five bags per acre. Plots of kaffir-corn at Nsombo (Luwingu) on acid "Chipya" soil, previously dressed with lime at the rate of 2,000 lb. per acre, gave strikingly better yields than the controls (i.e. without lime).

Under conditions at Lunzuwa there was a small residual effect in the third year from applications of compost at the rate of five tons per acre.

There was a slight indication that, whereas for cowpeas previously cropped land ploughed in July was superior to land ploughed in November, for groundnuts the reverse was the case.

119. At Lunzuwa, a normal *Chitemene* dressing of ash gave better results than applications of superphosphate, whereas at Nsokolo and Mwamba seed farms the superphosphate plots were superior to those dressed with wood ashes. No significant difference can be recorded between the different rates of application of superphosphate. Little can be deduced from these results, owing to the abnormal season.

MSEKERA TOBACCO STATION, FORT JAMESON.

120. This was a very bad year for experiments on this station as the Province suffered severely from drought, and crops in general suffered badly. One or two tobacco fields, however, indicated that certain varieties stood up well to drought conditions. Planting and replanting tobacco took place almost every time sufficient rain fell. Although 25.44 inches of rain was recorded on the station, showers were very intermittent and fortnightly periods of blazing sun on the young plants scorched and killed them. Shading each plant with sprigs of leaves helped to keep the plants alive.

121. Seed beds for the 1948-49 season were sown from the 1st October to the 4th December, then, because it was evident that a drought had set in, sowing again took place on the 3rd January, after hastily removing the first sowings in the nursery and resowing. It proved satisfactory, although a risk was taken in sowing immediately on the same seed bed site.

Trials of Soil Fumigant.

122. A soil fumigant was used on the tobacco seed beds for the first time on this station. The seed bed site was divided into four equal blocks. Blocks A and D were treated with soil fumigant at the rate of 3.50 c.c. per square foot after the beds had been made up ; water was applied on the beds three times daily for three days. Blocks B and C were left untreated. The results were as follows :

Block A (treated) had twenty-six eelworm infested plants.

Block D (treated) had five eelworm infested plants.

Block B (untreated) had thirty-two eelworm infested plants.

Block C (untreated) had twenty-four eelworm infested plants.

This experiment is to be repeated in the 1949-50 season. A field trial with soil fumigant was disappointing because the yield of tobacco in both treated and control plots was too poor.

Rotation Experiments.

123. The various experiments involving different rotations of crops and grass with tobacco were continued, but owing to the drought the yields and the proportion of better grades were disappointing. The bulk of the crop was graded "semi-bright", whereas in previous years the proportion of "brights" has always been the highest.

124. Sunnhemp green manure crop, in two different experiments, suffered severely from a fungus that attacks and rots the stems above ground. It has been decided to use an alternative green manure crop, velvet beans, in future.

Tobacco Variety Trials.

125. Throughout the experiments there was a definite indication that the variety "Willow Leaf" was less affected by drought conditions than the other varieties. Three American varieties, namely, American White Stem Orinoco, American Yellow Mammoth, and American 400 were planted, but owing to the very severe conditions it would be unfair to comment on the result this year.

Fertiliser Trial.

126. For the second year a series of four (three and a control) manurial treatments for tobacco were tried. The treatments were as follows :

- (1) Control—no fertilizer.
- (2) 150 lb. per acre Type B fertilizer applied in three equal applications at intervals of two weeks after planting.
- (3) Compost and tobacco stem ash (proportion 7 : 1) applied two months before planting at 2 lb. per plant, plus 75 lb. per acre tobacco fertilizer applied two weeks after planting.
- (4) 150 lb. per acre of a mixture of fertilizer and tobacco ash (proportion 2 : 1) applied after planting in three equal dressings at intervals of two weeks.

The following is a summary of the results :

Treatment			1947-48	1948-49
(1)	...	...	492 lb. per acre	689 lb. per acre
(2)	...	...	579 lb. per acre	781 lb. per acre
(3)	...	...	880 lb. per acre	708 lb. per acre
(4)	...	...	598 lb. per acre	783 lb. per acre

The results are, as yet, inconclusive.

Petauke.

127. For the whole of the 1948-49 season there was no European officer stationed at Petauke. The drought affected the experimental work badly. The tobacco crop was 4,554 lb. leaf sold from six and a half acres (700 lb. per acre), which realised £497 0s. 11d. The quality was poor and mosaic infection was severe.

128. In the tobacco spacing trials, the close spacing at three feet six inches by fifteen inches continued to give the highest yields and 820 lb. per acre was recorded, compared with 575 lb. cured leaf per acre at three feet six inches by three feet six inches spacing. Other spacings yielded correspondingly lower than the fifteen-inch spacing. The yield at fifteen-inch spacing was more than twice the average yield obtained by most African growers (345 lb. per acre) spacing at three feet six inches by three feet six inches.

129. The new varieties of Burley tobacco obtained from the United States were not sufficient to make a bale, but samples were shown to the buyers and the White Burley, KY.16, and Barnet Special were preferred to KY.41 and Harrow Velvet which was very harsh. A variety trial is being planned for next year to compare yields and quality. In the rotation on contour strip ploughing started in 1945, the fertility seems to be maintained by composting once in a four-year rotation, i.e. tobacco, tobacco, groundnuts, maize. The compost is applied to the second tobacco crop.

The maize yielded 1,770 lb. per acre.

The groundnuts yielded 464 lb. per acre.

The first year tobacco (composted) yielded 588 lb. per acre.

These yields can be considered good, bearing in mind the season and the fact that the tobacco was planted very late.

130. The maize planted on strips ploughed down-hill, in contrast with the contour ploughing, gave only 949 lb. of maize per acre as against 1,770 lb. per acre on the contour.

131. Over a period of five years, eroded mound-cultivated (indigenous method) plots have yielded five bags of maize less per acre than the contoured and ridged plots, under experimental conditions.

Broken Hill.

132. In collaboration with Messrs. McArthur and Uys, the department continued experimental work on local problems. The work is in three sections :

- (i) Rotations including tobacco, groundnuts, maize and grass. The period under grassland varies from four to six years. A twenty-acre field has been subdivided into eight 2½ acre plots, on which the various rotations will be maintained over a period of at least eight years. The results in 1948-49 may be summarised as follows :

One plot (two and a half acres) maize gave thirty-one and a half bags, or 12.5 bags per acre.

One plot (two and a half acres) groundnuts was a failure—1.2 bags per acre.

Two plots (five acres) Virginia type tobacco gave 6,203 lb. which was sold at an average price of 3s. 2d. per lb.

Four plots (ten acres) were planted with grass—half of each plot with *Panicum makarikari* and half with Naivasha Star grass. The grasses were established very satisfactorily.

- (ii) Grass Ley—Fertilizer Trial. A twenty-four acre field was partly planted with Rhodes Grass. Ultimately the whole field will be under Rhodes Grass and there after ten two-acre strips will be used to test five different fertilizer treatments in duplicate.
- (iii) Utilisation of Seepage Areas. Twelve three-acre plots have been drained, ploughed and planted with various crops during the past two years. Green manure (sunn hemp) and fertilizer have been used as required. In 1948-49, wheat, rice and barley were a failure. Grass, including *Panicum makarikari*, *Paspalum dilatatum* and Rhodes grass planted towards the end of the rainy season did well. The future programme for these plots includes a comparison of rotations based on wheat, rice and barley respectively with grass or sunn hemp and fertilizer as required.

LEGISLATION.

133. During the year a Natural Resources Ordinance was drafted for presentation to the Legislature. Its object is to provide the necessary means to ensure that the natural resources of the Territory are conserved and, where possible, improved. Natural resources are defined as the soil and waters of the Territory ; animal, bird and fish life. The Ordinance provides that a Natural Resources Board shall be established to exercise general supervision over natural resources and measures for their conservation, to stimulate public interest in the conservation and improvement of natural resources, to recommend to the Governor any legislation or investigations concerning the conservation, use and improvement of natural resources that might be deemed necessary, and to ensure co-ordination between this Board and other Boards which concern natural resources. The Board is given certain powers to enable it to achieve its object, and provision is made for the declaration of intensive conservation areas and the formation of conservation committees where the owners of land in any area desire such a course.

GENERAL.

134. As from 1st January, 1949, Mr. G. B. Beckett, M.L.C., was appointed as the Unofficial Member of Legislative Council responsible for Agriculture and Natural Resources.

135. Of the many very helpful and distinguished visitors and missions to the Territory during the year, the department is particularly indebted to Drs. Lambert, McCall and Cline of the Economic Co-operation Administration, Dr. Harvey S. Stage also of the Economic Co-operation Administration, the Morrison Expedition and Messrs. Thorpe and Savile of the Sorghum Mission.

LUSAKA.

J. C. EYRE,
Director of Agriculture.

